A Contribution
TO
The Pathology of Orbital Tumors:

Being a Study of the Secondary Processes in the Periosteum and Bones of the Orbit and Vicinity.

BY
CHARLES STEDMAN BULL, A. M., M. D.

REPRINT FROM
The New York Medical Journal.
March, 1881.

This Paper is reprinted from The New York Medical Journal for March, 1881.

The contents of that number are as follows:

The New York Medical Journal is published monthly, and contains 112 closely printed octavo pages. It is devoted to the general practice of medicine, and aims to meet the wants of the general practitioner.

EDITED BY

FRANK P. FOSTER, M. D.,

PHYSICIAN FOR DISEASES OF WOMEN TO THE OUT-PATIENT DEPARTMENT OF THE NEW YORK HOSPITAL.

New York: D. APPLETON & CO., Publishers,

1, 3, & 5 BOND STREET.

Single Number, 40 Cents. Yearly Subscription, $4.00.

A CONTRIBUTION TO THE PATHOLOGY OF ORBITAL TUMORS: BEING A STUDY OF THE SECONDARY PROCESSES IN THE PERIOSTEUM AND BONES OF THE ORBIT AND VICINITY.*

By CHARLES STEDMAN BULL, A. M., M. D.,

LECTURER ON OPHTHALMOLOGY AND OTOLOGY IN THE BELLEVUE HOSPITAL MEDICAL COLLEGE; SURGEON AND PATHOLOGIST TO THE NEW YORK EYE AND EAR INFIRMARY; OPHTHALMIC SURGEON TO ST. MARY'S FREE HOSPITAL FOR CHILDREN, AND TO THE NURSERY AND CHILD'S HOSPITAL.

It is by no means uncommon for recurrent orbital tumors to involve the periosteum and bone, even when all possible precautions have been taken against their return at the time of their removal by operation. In many of these cases some of the morbid cellular elements have been left in the shreds of orbital tissue, or in the many fissures and sinuses communicating with the cavity of the orbit. But it seems not improbable that in some cases the periosteum or bone may have been the primary seat of the disease, which, in the majority of instances, is either pure sarcoma or myxo-sarcoma, or more rarely fibro-sarcoma. Although most orbital tumors, especially those arising from the connective tissue of the orbit, are sarcomatous in their nature, it is not safe to always so consider them. Tumors are often anomalous, only because they are met with in a locality in which their elements do not always exist. When a morbid growth in the orbit has been removed, either with or with-

* Read before the Medical Society of the State of New York, February, 1881.

out enucleation of the eye, the chances of its return are much smaller if it has been found encapsulated; and, when in such a case the orbit again becomes filled, we have to choose between assuming a nidus of disease left behind and a new secondary tumor. But the presence of pathological cellular elements presupposes either a wandering of cells through blood-vessels or lymphatics, or both, into the neighboring tissues or cavities, or else a new formation in the locality itself. If we accept the former view, which is preferable, we assume that these wandering pathological cells become massed together and fixed in the capillaries, act as emboli, and here increase. The origin of cell formation is not different in pathological processes in this locality from what it is elsewhere in the body, and will not be discussed here. Let it suffice to say that giant cells, or the myeloplaxes of Wagner and other modern pathologists, are mother cells, containing daughter cells, and that they occur especially in sarcoma. Wagner thinks that, where these giant cells occur in bone tissue, they are probably metamorphosed osteoblasts; and, according to Kölliker, they are osteophagi or bone-eaters, because they dissolve bone tissue. Be this as it may, they are certainly of importance in the sarcomatous tumors of bone, and this is especially so in the bones of the orbit. They are sometimes too few in number and too inconstant in their occurrence to materially change the character of the tissue in which they occur; but in many sarcomata they give the character to the entire neoplasm by their great number.

The secondary processes observed in bone and periosteum, which form the subject of this paper, are a general infiltration, softening, and degeneration of bone tissue, and the development of exostoses and osteophytes from and in the walls of the orbit. The subject of true osteomata, or of osteo-sarcomata, does not come within the scope of the paper any more than does hyperostosis. This process of infiltration is strictly one of disintegration, in which the apparent destructive power of the giant cells seems to be paramount. The development of pathological bone tissue takes place generally from new-formed or normal connective tissue, especially from periosteum, and it probably arises but seldom from pure osseous tissue. The growth of new-formed osseous tissue is in part interstitial, and mainly intercellular, through increase of the intercellular substance. But in this pathological infiltration of the bone with sarcomatous elements there is little or no intercellular substance. As regards the osteophytes, the process is different. The modern definition of an osteophyte is "an osseous neoplasm firmly attached to the surface of bone, but distinguished from the latter by its spongy texture

and great vascularity." In the writer's cases, however, the osteophytes arose from the periosteum, as the result of what seemed like periostitis ossificans, with a special predilection for the roof and inner wall of the orbit. Some authors regard both exostoses and osteophytes as examples of osteoma, and call the former homologous osteomata, while the osteophytes are called heterologous osteomata. According to Green, for example, exostoses are outgrowths from preëxisting bone, but may grow from the periosteum, and become dense and eburnated; and this is especially the case in the orbit. He says also that there is usually a line of demarkation between them and the subjacent bone. On the other hand, the heterologous osteomata, or osteophytes, originate apart from bone, and grow from connective tissue, especially in tissues in the neighborhood of bones which have been the seat of chronic inflammation; and hence are inflammatory formations. But it seems to the writer that this statement should be modified, at least so far as the orbit is concerned. Here the osteophytes certainly do not occur in the free orbital tissue, but are always attached either to the periosteum, from which they arise, or to the bone itself; and it may be stated with positiveness, that the metamorphosis of neoplastic inflammatory products into osseous tissue occurs especially in tumors which proceed from bone or periosteum. The development of these osteophytes, as the result of the metamorphosis of the cellular elements of plastic inflammation, seems to be not a very uncommon complication of recurrent orbital sarcomata; and in some instances this process of bone growth may be seen by the side of bone disintegration, produced by the infiltration of the bone tissue with the myeloplaxes of sarcoma. How far these processes go on side by side, how intimate the connection between the two may be, and which comes first in the order of time, it as yet seems very difficult to decide, though it is probable that the osseous disintegration by infiltration with giant cells is the later process of the two. The question has been raised whether these two processes, exostosis and bone disintegration, are not different steps of the same process. A careful microscopic examination of these osteophytes has shown that they may be either diffuse and laminated, or warty and like stalactitic projections from the bone surface. According to Wagner, they consist in the early stage of a reticular osseous tissue, a vessel surrounded by fibrous tissue running in the center of the spaces. As they grow, the bony mass increases, mostly in concentric strata, which deposits fill the spaces until nothing is left inside but the vessel, and eventually the latter may disappear. The osteophytes then either remain permanently, or, as Wagner suggests, may disintegrate; a dissolu-

tion of the osseous tissue takes place, and the secondary or spongy state is reached. Whether this stage is identical with that in which the bone is infiltrated with giant cells, like those contained in the sarcoma of bones and the orbit, is a matter which will admit of discussion.

Sarcoma is recognized as belonging to the group of connective-tissue tumors, but is distinguished from types of this group by the preponderance of its cellular constituents, both in size and in number. In the orbit the amount of connective tissue is considerable, though the meshes are very loose and most of them large, and we should naturally expect to find in sarcomata developed here a considerable amount of connective tissue; but this is not often the case. The intercellular substance here, though it may be fibrillar, is very apt to be granular and even homogeneous, while the cells enormously preponderate.

The influence of locality upon the development of sarcomata is said to be clearly evident, the osteo-sarcomata appearing on the surface of bones, while the softer forms, rich in cells, arise in the medullary cavity. But in the orbit it would seem as if the tumors were very frequently of the medullary variety. A myxomatous element is very often present in sarcomatous tumors of the orbit, especially in the recurrent growths. As a rule, the more developed the cellular element of a sarcoma is, the more rapidly does it grow and the farther it extends, and this is especially true of the orbit. Here the neoplasm does not grow in one direction only, but in all directions along the small blood-vessels and lymphatics, though it may tend to grow more in one direction than in others. Another fact to be remembered, as of especial importance in the orbit, is that, when these tumors recur after extirpation, the recurring growths are always richer in cells than the original tumor; they consequently grow much more rapidly, and are more apt to be myxo-sarcomatous than purely sarcomatous.

The size and rapidity of growth of a tumor in the orbit are usually indicative of its nature, and its growth here seems generally to be entirely beyond the laws which govern ordinary development in the body. Of course, in all cases of malignant orbital tumors, the great danger is the extension of the growth into the cavity of the skull. This may take place through the preëxisting normal anatomical canals or openings, like the optic foramen or the sphenoidal fissure, or by destruction of the roof of the orbit by caries, beginning, according to Perls, as an osteitis, and ending in meningitis and encephalitis. The more frequent form of extension is, however, probably by dissemination of the cellular elements of the

tumor, and this is especially so in sarcomata. In this connection it should be mentioned that, in operating for the removal of a primary intra-orbital sarcoma, careful anatomical search should be made through the entire orbit for the presence of enlarged lymphatics or infiltrated glands, as these are a common channel of propagation and a frequent cause of the recurrence of the tumor.

The following three cases illustrate the changes in the bones of the orbit and face referred to. They were under the author's care for varying lengths of time, and the patients underwent a series of operations for the removal of the tumors.

Case I.—*Encapsulated Orbital Sarcoma; Extirpation; Return of the Growth as a Myxo-Sarcoma; Infiltration of all the Bones of the Orbit, and of the Facial Bones of the Left Side in general; Three Operations for the Removal of the Tumor.*—J. H., aged twenty-two, first seen December 15, 1879. Was perfectly well until two weeks before, when he noticed that the left upper lid began to droop, and the left eye protruded. The ptosis and exophthalmus steadily increased. There had been convergent squint in the left eye since childhood. When he presented himself, the ptosis covered about two thirds of the cornea, there was slight protrusion of the eye, and the motility of the eyeball was limited in all directions, but mainly outward and inward. There was nothing abnormal in the fundus, not even any change in the retinal circulation. $V = \frac{20}{XX}$ in both eyes. On the 22d he began to complain of a constant dull pain in the orbit, and the ocular conjunctiva of the external rectus became chemotic. The arteries upon the optic disk became narrowed, and there appeared signs of perivasculitis. There was a faint regurgitant murmur, heard at the apex of the heart, and a murmur at the base with each sound. On the 24th there was discovered on the floor of the orbit a hard, resisting growth, reaching from the infra-orbital notch to the external canthus, which pressed the lower lid forward and could be followed for some distance into the orbit. It was very sensitive on pressure, and the seat of a constant dull pain. There was no pulsation felt or seen, nor any bruit heard. Vision had sunk in the left eye to $\frac{20}{CC'}$, which with a convex 12 spherical could be improved to $\frac{20}{L}$. The patient was urged to allow an operation to be done for the removal of the growth, but declined, and withdrew himself from treatment.

Nothing was seen of him till February 16, 1880, nearly eight weeks later, when the exophthalmus was very marked, the eye being shoved upward and inward; the lower half of the cornea was opaque, and the upper half anæsthetic. There was a dense infiltration of the palpebral and ocular conjunctiva below the horizontal meridian. The lower lid was completely everted, the eyeball immovable, and vision reduced to faint perception of light. The orbital growth was very prominent at the external canthus, and exceedingly sensitive, and the patient suffered constant pain that had worn him to a shadow. The operation was performed on February 18, 1880, the conjunctiva being split parallel to the lower cul-de-sac, from the middle outward to the canthus. The tumor was found to extend far back toward the apex of the orbit, but was enucleated with comparative ease, as it was found to be encapsulated and only loosely adherent to the orbital tissue. Only one point of firm adhesion was found, and this was to the outer side of the

sheath of the optic nerve. The orbital tissue was found so densely infiltrated by the products of cellulitis that it was decided to enucleate the eye. A careful examination of the orbit was then made, to determine whether there were any more growths, but none were discovered. The cellulitis was most marked on the floor and outer side of the orbit, and seemed to have been caused by the presence of the tumor. The patient did well from the beginning, and the orbital cellulitis slowly subsided. On March 20th the orbital tissue and the conjunctiva were still so infiltrated as to protrude slightly through the lids, and a plastic operation was done for the removal of some of the thickened tissue, for the purpose of enabling the patient to wear an artificial eye. This was successful, but on April 5th there were well-marked signs of recurrence of the tumor in the orbit, the lower lid being again pressed forward.

The second operation for the removal of the growth was performed April 13th. It was found to be closely adherent to the periosteum of the margin and floor of the orbit, and reached back to the apex—in this differing from the first tumor, which was encapsulated and nowhere very adherent. It seemed more like a general infiltration of the orbital tissue, and was very vascular—in this point also differing from the first tumor. Its adhesions to the periosteum at the lower orbital margin were extremely firm, exciting a suspicion that the tumor was an outgrowth from the periosteum. The operation was very tedious, and the patient lost a great deal of blood, as the external canthus had to be slit, in order to give more room to work in. The orbit was cleaned of everything as completely as possible, and the periosteum was stripped up from the lower margin and floor of the orbit as far back as could be reached. The roof and inner wall of the orbit did not seem to be involved by the growth, and were left undisturbed. The orbit was then washed out with a five-per-cent. solution of carbolic acid, and then painted over with a forty-grain solution of zinc chloride. In spite of this, the hæmorrhage was so profuse that the orbit had to be plugged. Violent inflammatory reaction followed in the skin and subcutaneous tissue of the lids, cheek, and temples, and the plugging of borated cotton had to be removed. The orbit was then washed again with the carbolic-acid solution, but the hæmorrhage again recurred. This led to a further careful examination of the orbit, and the growth could be seen presenting in the sphenoidal fissure and optic foramen. Plugging was resorted to and maintained for thirty-six hours, but then the plug had to be removed, owing to the erysipelatous condition of the lids and cheek. Under the influence of iron and quinine internally, and hot lead-and-opium applications externally, this condition subsided in about two weeks, and then the patient did well. On June 11th both lids were retracted and adherent to the external angle of the orbit, and the lower lid was adherent to the lower orbital margin throughout the external two thirds. The cavity of the orbit was much contracted, but there was no demonstrable return of the growth. On June 25th a hard, firm nodule, as large as a hazel-nut, was found over the malar prominence, firmly adherent to the periosteum, but not to the skin. This continued to grow, and on July 30th another nodule was discovered on the orbital margin, near the inner canthus, as large as a bean, firmly adherent to the periosteum and connected with another growth in the orbit, near the *inner* wall.

On September 7th he presented himself for another operation. The pain was constant and severe, and had been for several weeks, but there were absolutely no head symptoms at any time. The tumor outside the orbit covered the malar

bone, extended over upon the superior maxilla and outward upon the temple, filling the temporal fossa. It was irregular, and had a nodulated surface, and the skin was drawn tightly over it, but was not adherent. The growth filled the orbit, involving the floor and the inner and outer walls, and the outer third of the upper lid. An incision was made along the lower lid margin, as in the Arlt-Jaesche operation for entropium, and was extended two inches from the external canthus toward the ear. Another incision was then made from the inner end of the first incision down, along the nasal furrow, to the ala of the nose. This skin-flap was then carefully dissected up and reflected from the growth, and during this process several vessels had to be tied. The extra-orbital portion of the tumor was then cleared from the superior maxilla and malar bone with some difficulty, and also from the temporal fossa as far as practicable. The orbit was then again thoroughly cleared, but the hæmorrhage was profuse, and interfered greatly with the operation. There was a large hole through the floor of the orbit opening into the maxillary sinus, the bone having been disintegrated and absorbed by infiltration with the myeloplaxes, and the antrum was found filled with the growth. There was also a ragged hole anteriorly through the wall of the antrum, just above the alveolar arch. After the hæmorrhage had been checked, the growth was found to fill the left nasal sinus, the ethmoid cells, and the sphenoidal fissure; and the ethmoid, lachrymal, and part of the sphenoid bones were found so infiltrated with the growth that the finger could be pushed through, showing that the bony tissue had disintegrated and been absorbed. From the roof of the orbit quite a number of straight and hook-like osteophytes projected, and the whole surface of the bone was roughened. On the outer wall of the orbit, especially near the external angle, the bone was infiltrated and disintegrated by the cellular growth, as in the inner wall. Around the hole in the anterior surface of the superior maxillary bone there were some small osteophytes, showing that this hyperplastic tendency in the diseased periosteum existed here also. There were no signs of any spongy exostosis springing from the superior maxilla, such as is often met with. It was deemed unsafe to meddle with the osteophytes growing from the roof of the orbit, for fear of opening into the cranial cavity. The orbit was, therefore, again washed out with a solution of carbolic acid, the flap of skin was replaced over the superior maxilla and kept in position by sutures, and the outer half of the opening was closed by bringing the remains of the lids together with sutures. There was a good deal of inflammatory reaction from the severity of the operation, but the patient did fairly well under stimulant and restorative treatment, and the flap united perfectly.

On October 13th there was a recurrence of the growth in the cheek, evidently proceeding from the antrum through the hole in the anterior surface of the maxilla. This grew with great rapidity and was very painful, and the patient was more exhausted than at any previous period; but the writer did not deem any further operative interference justifiable. Though all the bones of the face on the left side, except the lower jaw, were involved, as well as the frontal, ethmoid, and sphenoid bones, there had never been any head symptoms, the direction of the growth having been outward rather than inward.

A microscopical examination of the original encapsulated tumor showed it to be a sarcoma of the small round-cell variety, with a few fusiform cells. Each of the recurrent growths showed a greater increase of the fusiform and of the large giant cells, with an admixture of mucoid tissue, answering to the appearance of myxo-sarcoma. In places there were very large numbers of giant cells, and this

was especially the case in the last growth, in the portions removed from the ethmoid and superior maxillary bones.

Case II.—*Intra-ocular Sarcoma; Secondary Infiltration of the Optic Nerve and Orbit; Degeneration of the Bones of the Orbit and Face; Four Operations for the Removal of the Growth.*—Julia M., aged twenty-six, first seen July 7, 1879, gave the following history: Sixteen months before, while recovering from confinement, she found, one morning, that she was totally blind in the left eye, and that the eye diverged. It remained in this condition, quiet and painless, till six months ago, when she again became pregnant, and since then there has been constant pain in the eye, temple, and supra-orbital region. An examination showed a normal cornea, the anterior chamber almost abolished, the iris nearly in contact with the cornea, the pupil dilated *ad maximum*, and the lens pushed far forward toward the cornea. In the upper and outer quadrant there was a small ciliary staphyloma, and the tension was perceptibly increased. An intra-ocular growth being suspected, and there being no reflex from the fundus and no vision, enucleation was advised and consented to. Some difficulty was found in dividing the optic nerve, owing to the thick, hard nodule of tissue which surrounded the nerve at its entrance into the sclera, and extended for some distance backward along the nerve. The latter was therefore drawn as far forward from the optic foramen as possible before being divided. On opening the eyeball, an intra-ocular growth was found nearly filling the interior, apparently starting from the choroid, which had perforated the sclera in the vicinity of the nerve entrance. The vitreous was absorbed, the retina was entirely detached and jammed against the lens, and the iris was retracted at the periphery. The distal end of the optic nerve looked healthy, and there was no apparent infiltration of the orbital tissue.

The patient was discharged at the end of a week, with directions to report once a week, but she was not seen till August 27th, when the growth was found to have returned in the orbit, and the conjunctiva bulged forward. As she was about to be confined, it was thought best to postpone the operation; but when again seen, on October 30th, five weeks after confinement, she presented a horrible appearance. The tumor had grown with alarming rapidity, had entirely filled the orbit, and protruded through the widely distended lids for a distance of over two inches. There was great swelling of the skin of the forehead, temple, and cheek, due to the great pressure produced by the tumor. The skin of the lids was livid, the palpebral aperture was distended almost to bursting, and there was an agonizing, gnawing pain in the orbit and head. The surface of the neoplasm was bleeding, and discharged a thick puriform fluid of fœtid odor. An incision was made with scissors along the ciliary margins of both lids, so as to free the conjunctiva completely from the lids, and then, by means of the blunt hook, scissors, and the finger, the adhesions of the growth to the orbital walls were broken up—none being found close and dense, except near the apex of the orbit. After the main mass of the tumor had been removed, an examination showed that the orbital margin at both the internal and the external canthus was diseased, the periosteum being perforated and infiltrated, and the bone roughened. There was profuse hæmorrhage, which was with difficulty controlled. The orbit was then thoroughly cleaned out, and as much as possible of the growth which projected from the optic foramen and sphenoidal fissure was cut off. The orbital margin was then cleared of its periosteum, and the bone was thoroughly scraped. The general periosteal lining of the orbit did not seem to be diseased. The

cavity was then washed out with carbolized solutions, packed with carbolized sponges, and covered by carbolized dressings and a tight bandage. There was very little inflammatory reaction, and the patient rapidly recovered. On December 3d there was noticed a suspicious nodular swelling in the skin of the upper lid at the external angle, which was dense, somewhat elastic, attached to the bone, and grew forward and inward toward the median line, closing the orbital aperture in this direction.

On December 27th this recurrent tumor was excised. The external canthus was divided for a distance of an inch and a quarter. The outer two thirds of the upper lid were removed with the growth, which was found to be only loosely attached to the periosteum. The latter was found diseased, and was removed from the exterior and interior of the orbit in all directions as far as its condition was at all suspicious. The bone was found infiltrated, especially the external angle of the frontal, and was removed by the rongeur and scraper to a considerable depth. The orbit itself appeared empty, and was not disturbed. The patient did very well, and improved steadily in health till March 8th, 1880, when a well-defined nodule was seen at the inner end of the upper lid, and extending over on the nose and into the lower lid, and another nodule in the outer third of the lower lid. These nodules grew rapidly; she complained of great pain in the orbit and head, and the whole left side of the face became red and swollen. On March 13th the lids burst open; there was a profuse discharge of blood and pus, and the pain almost entirely ceased. The tumor again filled the orbit, had broken through the line of union between the lids which closed the orbital aperture, and presented as a bleeding, fungus-like mass.

On March 17, 1880, the fourth operation was done. The internal canthus was divided horizontally as far as the median line of the nose. The remains of the upper and lower lids were dissected up from the growth and thrown back, and the orbit was then slowly cleaned out with hooks, scissors, and finger. The growth was very soft and exceedingly vascular. The roof, floor, and inner wall of the orbit were found very much diseased, rough, necrosed, and infiltrated in places to such a degree that the bone crumbled on pressure. The whole roof was covered with osteophytes, straight and hooked, all sharp and hard, like stalactites, and between them there were several small openings into the cranial cavity. The os planum of the ethmoid was completely honeycombed; there was a large opening through the lachrymal bone into the nasal fossa, and one into the maxillary sinus through the floor of the orbit. The ethmoid cells were changed into one large cavity, containing *débris* of bone and some of the cellular growth. After all the detritus was removed that it was deemed safe to touch, the cavity was carefully and slowly cleansed and then plugged with borated cotton. The patient reacted well, and, union at the two canthi being complete on the third day, the sutures were removed.

The patient did well until May 11, 1880, when the tumor reappeared in the orbit, coming from the antrum and ethmoid and from both canthi, the bone itself being the source. No further operation was deemed of any use, and the patient was admitted to a general hospital, where she lingered until November 23, 1880, when death occurred. No autopsy was allowed.

In this case the tumor was originally an intra-ocular choroidal sarcoma, which had perforated the sclera near the optic-nerve entrance, involved the sheath of the nerve, and thence spread to the

orbital tissue. As an orbital growth, therefore, its seat was primarily in connective tissue, and it subsequently involved the periosteum and the orbital walls. The choroidal sarcoma was of the usual small round-cell variety, and presented nothing peculiar in its course. The orbital tumor was at first sarcomatous, though the proportion of mucoid tissue was less than in the previous case. But the number of myeloplaxes was large, and their number grew greater, in proportion to the other cellular elements, with each recurrence of the tumor. In this case, in spite of the holes of communication between orbit and cranium through the roof of the orbit, there were no head symptoms until just before death.

In both these cases the influence of operative interference in hastening the recurrence of the tumor seemed very marked. They both seem to show, also, that the stripping up and removal of diseased periosteum hastens the return of the disease in the bone, even when the latter has been carefully scraped at the time. Both cases show the general deformity of the orbit through disintegration and destruction of the bony walls; and both illustrate how long a malignant process can go on in the bony wall and sinuses separating orbit from brain without any complication being set up in the vital organs within the skull. Certainly in the second case there was good reason for expecting meningitis of the left anterior fossa, with encephalitis and abscess, and yet the patient remained free from any head symptoms until near the end.

Case III.—*Fibro-Sarcoma of the Orbit, involving the Periosteal Lining, and subsequently the Bones of the Orbit and Face.*—W. J., aged forty-eight, first seen in January, 1880, gave the following history: For many years he had suffered from an obstinate naso-pharyngeal catarrh with profuse discharge, which five years ago extended to the nasal duct and lachrymal sac. An abscess formed on each side of the nose, which was opened, and afterward the usual operation for stricture of the duct was done, and since then he had had very little trouble. Early in the winter of 1878–'79 the left eye began to protrude, and there was also some swelling of the lids and cheek. The conjunctiva became chemotic around the cornea, and there was considerable muco-purulent discharge. There was not much change in the parts till April, when the discharge ceased, the chemosis disappeared, and vision began to fail. From this time the exophthalmus rapidly increased and the vision as rapidly diminished, while the eyelids and left cheek became very much swollen. In May the skin of the cheek became so tense that it ruptured in two places, one just over the malar prominence and the other just below the internal canthal ligament. Through these openings exuded a thin purulent discharge. There had been for some months a dull, heavy pain deep in the orbit, but the patient only spoke of it when questioned directly on the subject. When he presented himself for examination the exophthalmus was very marked, the eye being pushed forward and inward toward the median line, so that it was nearly on a plane with the bridge of the nose. It was almost im-

movable, there being still, however, a little motion inward. The cornea was slightly cloudy, but the iris and pupil were normal, and $V = \frac{10}{C}$. An ophthalmoscopic examination showed the media clear, except the slight haziness of the cornea, and a moderate degree of neuro-retinitis, with not much swelling of the disk, except in the infero-nasal quadrant, where it had all the appearances of choked disk. There were three external openings, two in the cheek and one in the lower lid near the external canthus. All three pouted, resembling very closely the mouths of sinuses leading down to necrosed bone, and discharged a small amount of thin pus, of a very offensive odor. The patient was unusually stupid, and could with difficulty be communicated with. A probe, introduced into either of the three openings, passed for some distance into the orbit, but no dead bone was struck. The opening near the inner canthal ligament seemed to communicate with the nasal sinus and the ethmoid cells, for a probe passed into a cavity that led off from the orbit. The eyeball could not be replaced in the slightest degree, and the growth in the orbit was very firm and dense.

The patient was urged to have the eye removed and the entire contents of the orbit cleared out, but declined, as he still had considerable vision in the eye. He was not seen till the following June, when he presented a horrible appearance. Vision was entirely lost, the cornea had sloughed, the contents of the eyeball had gradually been discharged, and the pain was constant and very severe. The intra-orbital growth presented through the openings in the lids, the latter being distended to their utmost capacity. The tumor was not particularly vascular, but its surface discharged a thin, offensive pus. It was hard, firm, closely attached to the periosteum of the orbital walls, and extended down upon the malar and superior maxillary bones, and outward upon the temple. From the intimate connection between the growth and the periosteum at the margin of the orbit, it was suspected that the bones forming the inner wall of the orbit were involved. The remains of the eyeball were first removed, and then the contents of the orbit dissected out. The adhesions to the periosteal lining were everywhere very close, and hence it was extremely uncertain whether the growth began in the loose connective tissue of the orbit or in the denser tissue of the periosteum. When the region of the ethmoid bone was reached, the os planum was found to have almost entirely disappeared, and the growth filled the ethmoid cells and extended into the nasal sinus. On lifting up the tumor, a hole was discovered in the floor of the orbit, leading into the antrum, through which, also, the growth extended, and, as far as could be judged by the introduction of a probe, it filled the antrum. It was not deemed wise to enlarge this opening, but as much of the tumor as could be reached with forceps and scissors was removed. The interior of the ethmoid bone was softened and broken down and infiltrated with the cellular elements of the growth. A flap of skin was then dissected from the superior maxilla and malar bone, its apex being at the inner canthus, and the lines of incision running, one along the margin of the lower lid and from the external canthus out half an inch upon the temple, and the other down the nasal furrow to the ala of the nose. The periosteum and growth attached to it in this region were then carefully removed as far as there appeared any morbid growth, and the bone was scraped. After the orbital cavity had been carefully washed out, the deep growth of the tumor was seen to penetrate so far into the cavities and sinuses connecting with the orbit that it was not thought advisable to attempt any further removal. It was seen that the lachrymal bone had disap-

peared by disintegration and absorption, that the ethmoid, frontal, and superior maxilla were deeply involved, and that probably all the deep bones of the face on the left side were implicated. The flap of skin was replaced and attached by numerous sutures, and the orbit was packed with borated cotton. The patient reacted well from the operation, and the wound healed rapidly; so that at the end of three weeks the patient could be discharged, free from pain, and with very little secretion from the orbit. The holes in the skin of the cheek, however, did not show any tendency to cicatrize. The patient left the city, and has never been seen since.

A microscopic examination of the tumor showed it to be, contrary to expectation, a fibro-sarcoma, with, however, very extensive cellular development. Where the fibro-sarcomatous character was most pronounced, the cells were generally fusiform; but the nearer the bone the tumor was examined, the more cellular elements appeared, both round and fusiform. None of the round cells were very small, and in the periosteum and in the detritus removed from the ethmoid cells were numbers of giant cells or myeloplaxes.

It does not seem probable that there was any connection in this case between the chronic inflammation of the nasal ducts and the malignant disease in the orbit. Though, no doubt, the long-continued disease of the ducts had led to periostitis, and perhaps caries of the bony walls of the ducts, yet the most that could be expected would have been an extension of the carious process to neighboring bones. It seems probable in this case that the growth started in the periosteum, the reason for this supposition being its fibro-sarcomatous nature; and that the bones were involved somewhat early in the course of the disease. Though in this case the direction of the growth was both outward and inward, yet the main efforts were spent in extension outward, as in the two other cases; and this explains the long freedom from head symptoms, even though there were direct channels of communication with the cranial cavity by disintegration of the bony wall.

If one may draw conclusions from these three cases, it would seem that such cases are not fit subjects for operative procedures. When the periosteum of the orbit or the orbital cellular tissue is involved, it does not seem possible to remove *all* the growth, owing to the nature of the parts; and any mass of cellular infiltration, no matter how small, becomes at once a starting-point for more rapid growth than before. With each operation there follows an increased rapidity of growth, the tumor showing a tendency to change from pure sarcoma to myxo-sarcoma. When once the bones of the orbit are involved, the writer does not believe that any further operative interference should be attempted. The rapidity of growth among the small bones of the face and base of the skull, and their disintegration by infiltration with the large sarcoma cells,

is very marked, especially in the case of the ethmoid and sphenoid bones; and the small amount of good attained by an operation is but temporary, and is far outweighed by the dangers of the operation, the severity of reaction, and the rapid recurrence of the growth.